

3. ESSENTIAL FISH HABITAT

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq.*, as amended by the Sustainable Fisheries Act in 1996, requires that Fishery Management Plans (FMPs) describe and identify essential fish habitat (EFH) within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit. Available information should be interpreted with a risk-averse approach to ensure that adequate areas are protected as EFH for the managed species. The HMS FMP addresses EFH for species managed under that plan in Chapter 6; the Billfish Amendment provides a description of EFH and related issues in Chapter 4. The EFH regulations also specify that new EFH funding information should be reviewed as it becomes available, and reported as part of the SAFE report. The FMP EFH provisions should be revised or amended, as warranted, based on the available information.

3.1 Atlantic Sharks

It has been recognized that a limiting factor on shark populations is the amount of suitable nursery habitat available. The importance of coastal and inshore nursery habitat to shark productivity has been recognized in the HMS FMP such that known shark nursery areas were designated EFH. The FMP also identified the need for further delineation of these areas and the determination of habitat relationships, information that is vital to the successful management of these species. To that effect, the HMS Management Division recently sponsored the preparation of an overarching document that provides a summary of a number of detailed studies of U.S. coastal shark nursery grounds in nearly all of the coastal states from New England to Texas. In addition to providing summaries of their findings, the researchers involved, representing universities and state and federal agencies, also provided raw data on juvenile shark catch and environmental parameters associated with these catches. GIS analyses of this data have resulted in further delineation of shark nursery habitat in the Atlantic Ocean and the Gulf of Mexico. This information will serve as the basis for updating early life stage EFH designations for a number of shark species in Amendment 1 to the HMS FMP, which will be developed in 2003.

2001 Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) Survey
(McCandless and Pratt, 2002)

Cooperation between federal and state governments in developing coordinated conservation measures is important to successful domestic management of coastal shark species because range, migrations and mating and pupping areas overlap some state and even federal jurisdictions. Many coastal species utilize highly productive bays and estuaries within state waters as nursery habitat (where parturition and young-of-the-year sharks occur) and/or secondary nursery habitat (utilized by juveniles, age 1+ only). Studies suggest that these inshore nursery grounds offer selective advantages of low predation rates and high forage abundance to juvenile sharks. Information on these areas is vital to understanding and managing sharks at this vulnerable stage where many sharks come closest to man's influence.

In 1998, the NOAA Fisheries Apex Predators Program (APP) formed the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) Survey. This is an alliance of NOAA Fisheries and state cooperators conducting ongoing investigations of shark nursery grounds along the East Coast of the United States. Results presented here are a summary of the work conducted in 2001, the fourth year of this study. In subsequent years, the program plans to continue the delineation of shark nursery areas, develop relative indices of abundance of neonate and juvenile sharks in these nursery areas, use the environmental data and bycatch collected to determine habitat relationships, and use tag and recapture data to determine if sharks return to their natal nurseries and define the overwintering nursery grounds.

State cooperators in 2001 included the North Carolina Division of Marine Fisheries, the South Carolina Department of Natural Resources, and the University of Georgia Marine Extension Service. Researchers from the NOAA Fisheries APP and the University of Rhode Island conducted the COASTSPAN study in Delaware Bay. COASTSPAN is funded by the NOAA Fisheries Highly Migratory Species Management Division.

COASTSPAN cooperators sampled a total of 2,706 sharks in 2001. Seven hundred and eight of the sharks sampled were tagged with fin tags and released. Juvenile sharks caught by the cooperators included the following: Atlantic sharpnose, blacknose, blacktip, bonnethead, finetooth, lemon, nurse, sandbar, sand tiger, scalloped hammerhead, tiger, and spinner sharks, and smooth dogfish.

DELAWARE BAY: COASTSPAN results show the importance of Delaware Bay as a pupping and nursery ground for sandbar sharks, and in the HMS FMP it has been designated EFH for the species. In addition, the middle and lower Bay has been designated a Habitat Area of Particular Concern for this species, consistent with provisions of the EFH regulations. Sandbar sharks in the Bay were captured from June through September of 2001 in waters with temperatures ranging from 17.5° to 26.0° C, salinity from 16.7 to 31.7 ppt, and depths from 0.6 to 27.4 m. They ranged in size from, 44 to 135 cm FL. Neonates were found from Port Mahon to Broadkill Beach on the Delaware coast with the highest abundance noted in July off of Broadkill Beach. On the New Jersey side of the Bay, neonates were found in highest abundance at Deadman's Shoal in July and off Villas in September. Neonates did not appear to utilize the higher current areas found in the center near the shipping channel and mouth of the Bay during sampling in 2001. Only during September, when the neonates are preparing for their first migration south for the winter, were neonates found in the center and mouth of the Bay. Juvenile (age 1+) sandbar sharks had a wide distribution throughout the Bay during their 2001 nursery season. These juveniles were most abundant in the lower current areas of the Bay above Mispillion, DE and Cape May, NJ. Although abundance within the mouth and center of the Bay along the shipping channel was low for juveniles (age 1+), there still appears to be some utilization of these areas throughout the nursery season. In 2001, 264 sharks were tagged and released in Delaware Bay and 3 (1%) of these sharks have been recaptured to date. There was also a six-year recapture in 2001 of a sandbar shark tagged in Delaware Bay in 1995.

Sand tiger sharks were captured in water temperatures ranging from 19 to 25 °C, salinity from 23.1 to 29.8 ppt, and a depth range from 2.8 m to 7.0 m. Captured sand tiger sharks ranged in size from 120 cm to 145 cm FL. Based on size all three of the sand tiger sharks captured were juveniles.

NORTH CAROLINA: Due to funding and logistical constraints there was no COASTSPAN sampling in North Carolina waters in 2001. There is only tag recapture data from previous years of COASTSPAN sampling in North Carolina's waters to report in 2001. There were eight recaptures of sharks tagged in North Carolina waters during the COASTSPAN survey in previous years. These consisted of seven young-of-year sandbar sharks and one Atlantic sharpnose shark, all tagged in 2000.

SOUTH CAROLINA: Sharks in South Carolina were sampled from April to December of 2001, with a total of 2,095 captured, and 763 tagged and released. The majority sampled were Atlantic sharpnose (1,052) and smooth dogfish sharks (280). Other species captured were blacknose, blacktip, bonnethead, finetooth, sandbar, scalloped hammerhead, spinner, lemon, and tiger sharks. These occurred primarily in Bulls Bay, St Helena Sound, North Edisto Estuary, and off Charleston Harbor. Water temperatures where the sharks were captured ranged from 25.0° to 31.2° C, salinities from 24.0 to 36.0 ppt, and water depths from 1.5 to 22.5 m. A number of finetooth, bonnethead, sandbar, scalloped hammerhead, and spinner sharks that were tagged in 2000 and 2001 were recaptured during the 2001 tagging season.

GEORGIA: Sharks in Georgia waters were sampled from April to September of 2001, with effort focused in the Doboy, Sapelo, St. Catherines, and Ossabaw sound systems. A total of 333 sharks were captured, and 104 tagged and released. Species composition consisted of Atlantic sharpnose, blacktip, bonnethead, finetooth, sandbar, scalloped hammerhead, spinner, and bull sharks. Atlantic sharpnose sharks were the most prevalent (250), followed by bonnethead (42), and blacktip sharks (16). Water temperatures where the sharks were captured ranged from 21.1° to 30.4° C, salinity from 23.3 to 33.4 ppt, and water depths from 3.1 to 11.0 m.

COASTSPAN Nurse Shark Mating and Nursery Grounds Project (Pratt and Carrier, 2002)

The Nurse Shark Mating and Nursery Grounds Project, conducted cooperatively by the NOAA Fisheries AAP, and Albion College (Albion, Michigan) has recently been included in the COASTSPAN program. Since 1991, the researchers, currently with support from the HMS Management Division, have undertaken studies on nurse shark (*Ginglymostoma cirratum*) behavioral ecology in the Dry Tortugas National Park, Florida, focusing on habitat utilization for mating and as nursery grounds. The area is a nearly pristine archipelago providing an ideal natural laboratory for *in situ* studies of this species, which lends itself to such investigations as it inhabits relatively shallow waters and is not far ranging. Also, the nurse shark is fairly docile, and individuals may be repeatedly observed and recaptured while still existing in a wild, uncompromised state. Thus, using diver identifiable tags, ultrasonic telemetry, systematic

observation over many years, and DNA fingerprinting, the researchers are beginning to answer management questions such as location and utilization of nursery grounds and season of mating and parturition. They have been able to study neonate, juvenile and adult distribution in local reefs, define elements of social structure and elucidate complex reproductive behaviors. Understanding how this habitat functions as breeding and nursery grounds will set a broad foundation from which to conduct life history, habitat, and behavioral studies of other species of sharks.

Since 1993, 183 nurse sharks (67 adults and 116 juveniles) have been tagged in the Dry Tortugas study population, with about 50 of the identified adults subsequently recaptured at least once. In the 617 mating events observed to date, known adults have been identified 274 times. Most identified adult males visit the study site faithfully every year; it appears that adult females visit the study area to seek refuge and mate in alternate years; consistently high juvenile recapture rates confirm that the juvenile population is largely site specific. Observations of neonates in June confirmed that the area is indeed a primary pupping and nursery ground as well as mating grounds. Future telemetry should provide a detailed record of activities of adults when they are present in the study area. Also, completing the DNA work will enable the researchers to determine the population structure and better understand social dynamics and reproductive success. Ultimately, this information should provide a basis for understanding such aspects of other shark species, as well.

From the continuing investigations, the researchers have learned that mating activities are vulnerable to the disruptive effects of wading, diving, electronic flash photography, boat traffic, including personal water craft (jet skis and kayaks), and to human presence. To reduce disruptive activities during the mating season, a proposal has been submitted to the National Park Service. The continued presence of neonate and older juveniles in the coral heads and on the adjacent grass flats is an encouraging sign that the area closure is effective and the presence of the research team not overly disruptive.

3.2 Atlantic Billfish

Blue Marlin Spawning and Nursery Habitat: 2002 Research Accomplishments

The blue marlin (*Makaira nigricans*) is a valuable, apex predator that has sustained several decades of heavy overfishing. The Atlantic stock, according to the most recent stock assessment, currently stands at ~40% of the level needed to provide maximum sustainable yield. Despite its economic and ecological importance, there is a dearth of information on precisely when, where and how often the blue marlin reproduces or on the factors that determine spawning success and the survival of their young. Without knowledge of the spatio-temporal extent of spawning and nursery grounds, fishery managers cannot consider the use of measures such as time-area fishing closures and protecting critical habitats.

The Southeast Fisheries Science Center (SEFSC) and the University of Miami (UM) have been cooperating over the last two years on a project that examines EFH for blue marlin focusing on Exuma Sound, a semi-enclosed body of water bounded by the islands of the Bahamas (Serafy *et al.*, 2003). Together, the SEFSC-UM team have conducted larval billfish surveys of surface waters of the Sound for three consecutive years. In 2002, the second phase of this project was implemented, whereby information gained from larval distribution, abundance and size-structure was used to guide the electronic tagging of adults for information on potential spawning areas and behavior. Specifically, state-of-the-art pop-up satellite tags were used to track the movements of adult blue marlin in waters upstream of Exuma Sound during June, 2002.

Both the adult tagging and the larval research components were highly successful in 2002. Twenty five adult blue marlin were tagged with pop-up satellite tags and less than a month later very high concentrations of larval blue marlin were collected in this area for a third time in three years. Fifteen of the 25 adults tagged traveled an average distance of 390 nautical miles in less than 40 days; travel distances ranged from 18 to 906 nautical miles. The researchers are currently in the process of analyzing adult movement tracks and larval distribution data for publication in peer-reviewed journals. This work will provide valuable insight into the nursery habitats of the Atlantic marlins as well as into the extent of adult movement during peak spawning periods. Over time, the ongoing investigations will provide critical information for the identification and protection of spawning and nursery habitats for the Atlantic marlins and possibly other billfishes in the region.

3.3 Atlantic Bluefin Tuna

Distribution of Western Atlantic Bluefin Tuna

The Tag-A-Giant (TAG) program, a collaborative effort among scientists from Stanford University, the Monterey Bay Aquarium, and NOAA Fisheries, was initiated in 1996 to examine the migrations and biology of giant bluefin tuna. These studies utilize several types of archival tags, including pop-up satellite archival tags, which download data to a computer via satellite once released from the fish, and archival tags that are implanted in the fish where they continuously record data. A total of 560 tags have been deployed in feeding grounds off the East Coast of North America (offshore waters of North Carolina and Massachusetts), and in breeding grounds of the Gulf of Mexico and the Mediterranean Sea. A comprehensive overview of the research and results to-date were included in the 2002 SAFE Report, based on Block *et al.*, 2001. The most recent report to ICCAT (SCRS, 2002) primarily addresses the latest information obtained from archival tags that were surgically inserted in 279 tunas off the coast of North Carolina between 1996 and 1999, and in January 2002 to collect data from the organism and its surroundings. Of the 279 tags, 57 (20.4%) have been recaptured as of July 1, 2002. The information obtained from these sources has provided an insight into the seasonal movements and environmental preferences of the species.

Current data appears to substantiate that information previously published in Block *et al.*, 2001. Generally, tunas tagged with archival tags off North Carolina were recaptured primarily from waters off New England and the Mediterranean Sea. Seasonal movement was from off the Carolinas in winter, into the Gulf stream in spring, and to New England waters in summer. Tuna tagged in the Gulf of Mexico surfaced west of the Loop Current, and to points north and east of the Current. Individuals also exited from the Gulf through the Straits of Florida and moving along the North American continental shelf. Results are consistent with other tagging data showing strong linkages between the Carolina and New England feeding areas, most importantly with a particular fidelity by tuna 10 years of age and younger in winter and summer, respectively. These size classes of fish make up a large proportion of the western fishery and appear to remain along the continental shelf during their adolescent and potentially their early breeding years. Three New England fish have shown a directed movement to the Gulf of Mexico breeding ground and in one case fidelity back to New England waters. Integration of remote sensing data substantiates that bluefin are concentrated in regions of peak oceanic primary productivity on winter and summer feeding grounds. The TAG program is continuing forward with plans to implant archival tags in more bluefin tuna in the Western Atlantic, as the multi-year tracks are extremely informative on ocean basin scales (SCRS, 2002).

Chapter 3 References

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